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(54) **Printing machine**

(57) A printing machine having at least one of the following features:

Nozzles for directing an air stream towards the underside of the leading edge of the top sheet in a feed stack in a direction upwards and towards the middle of said leading edge; a sheet feeder which moves the leading edge of the top sheet backwards before feeding it; a resilient backstop for the feed stack; a vacuum assisted plate clamp for the plate cylinder; and either means to impart temporary stiffness to printed sheets being collected, or means to accelerate delivered printed sheets on their way to a stacking means with reciprocable patters.

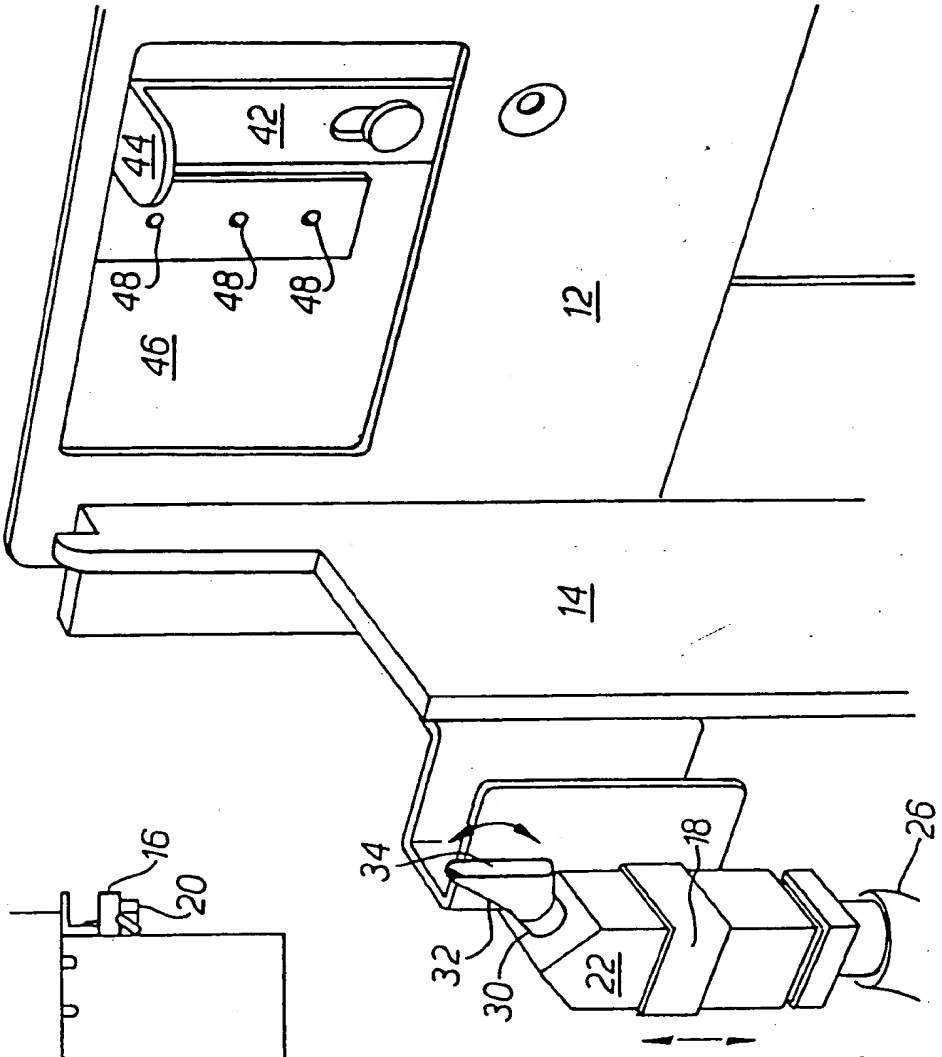


FIG. 2.

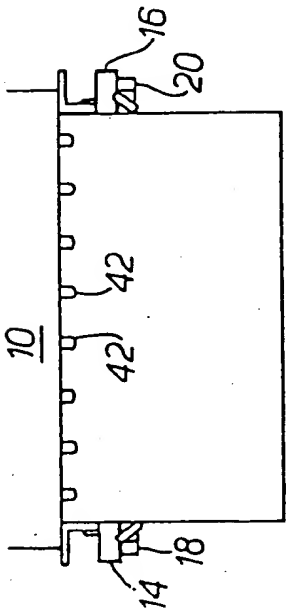
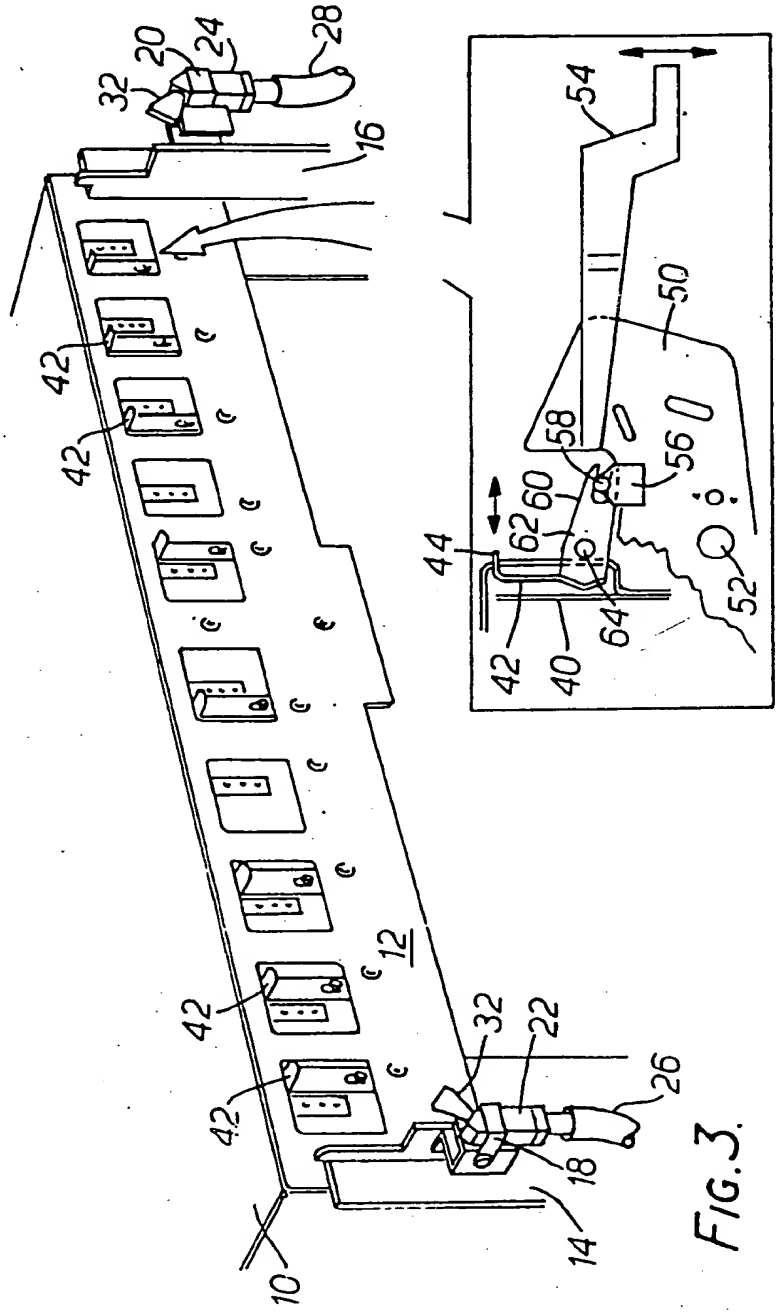


FIG. 1.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24
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FIG. 3.

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64
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FIG. 3A.

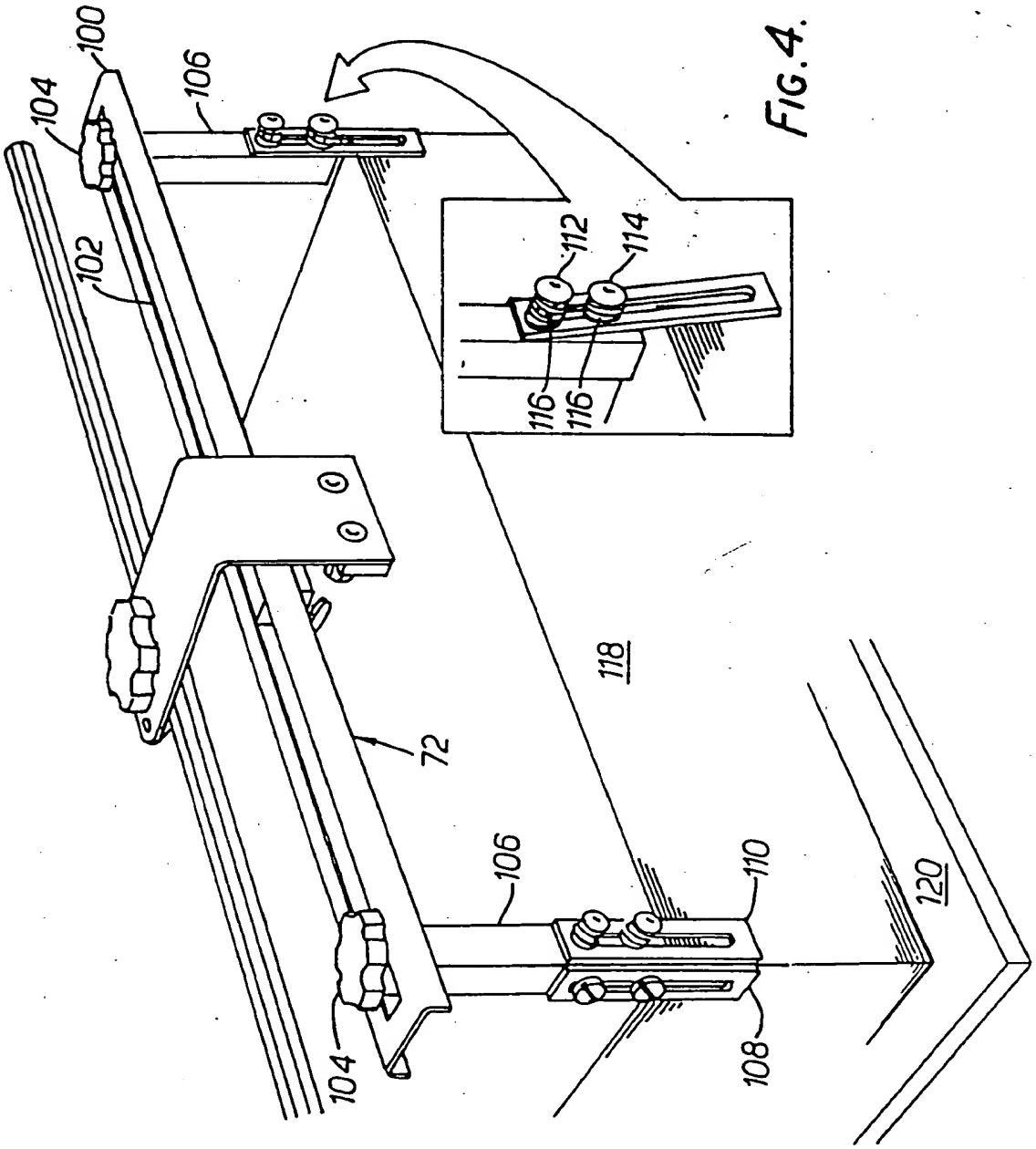

FIG. 4.

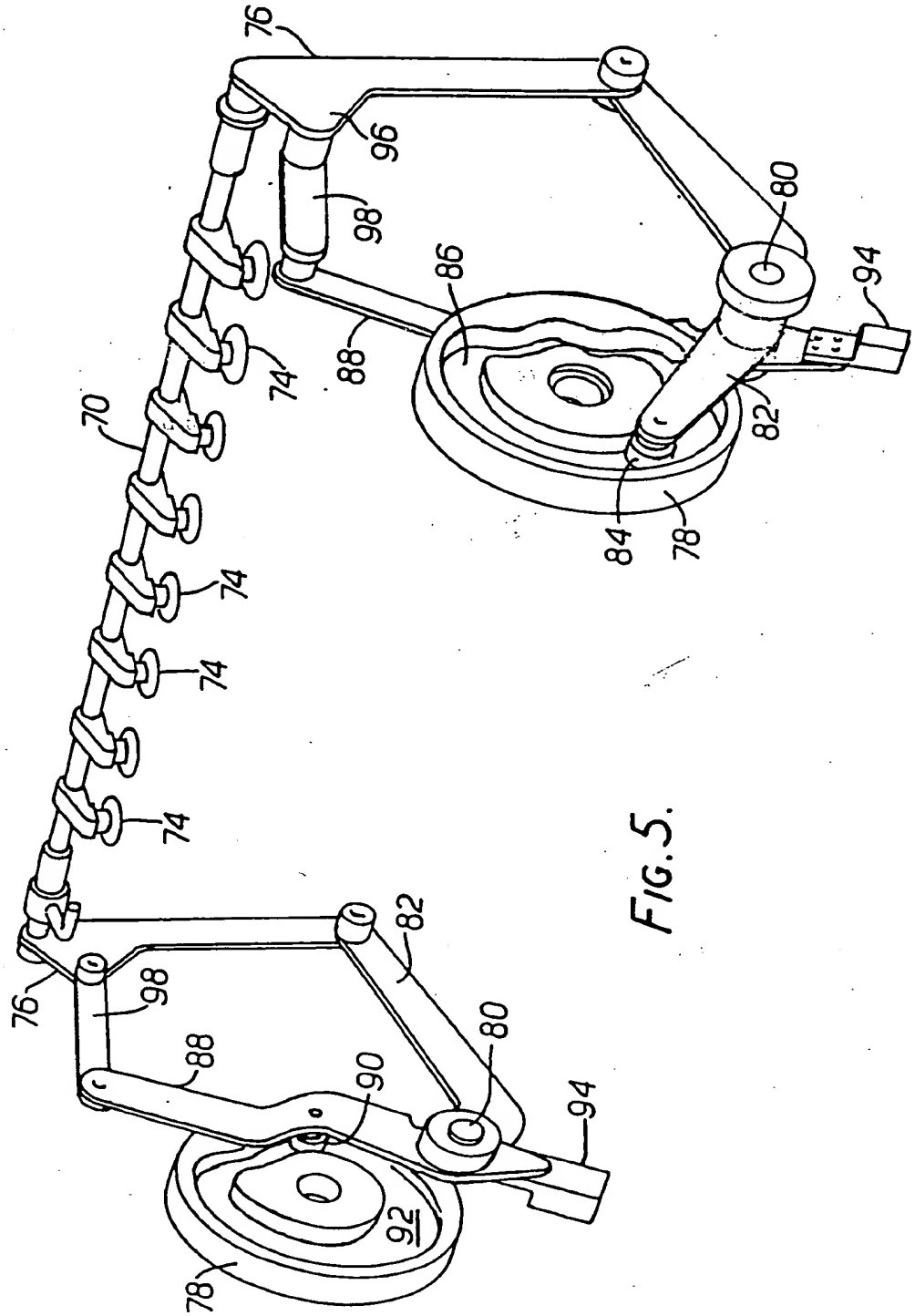

FIG. 5.

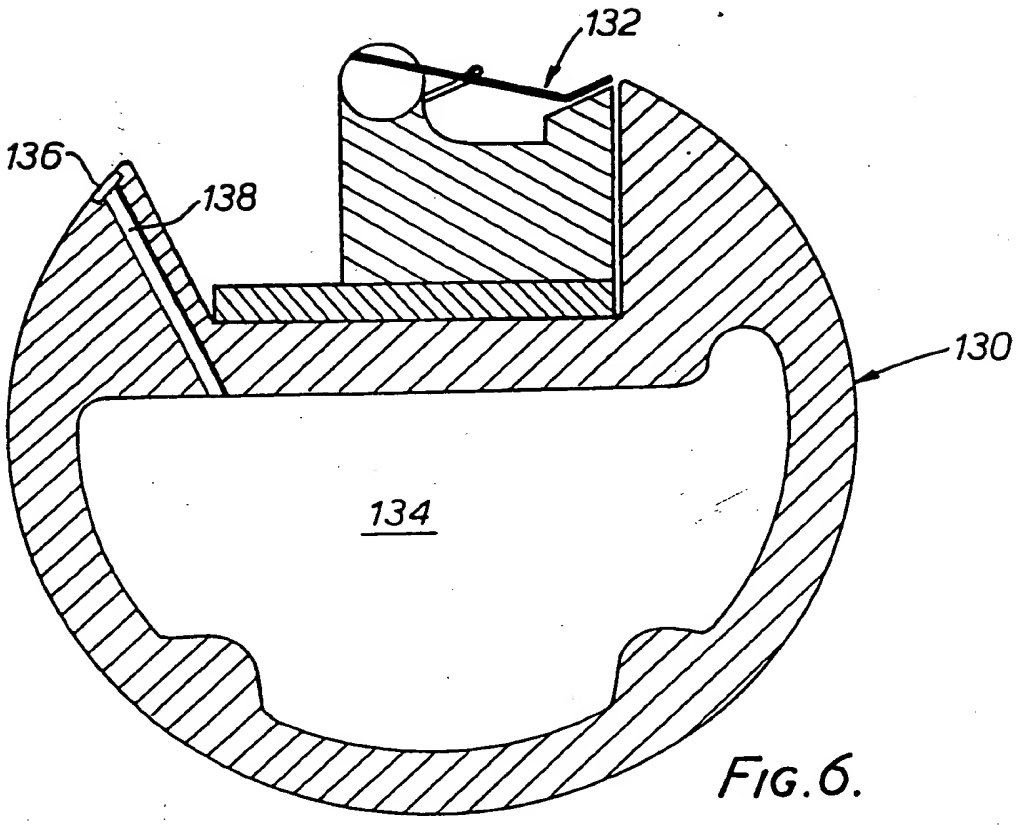

FIG. 6.

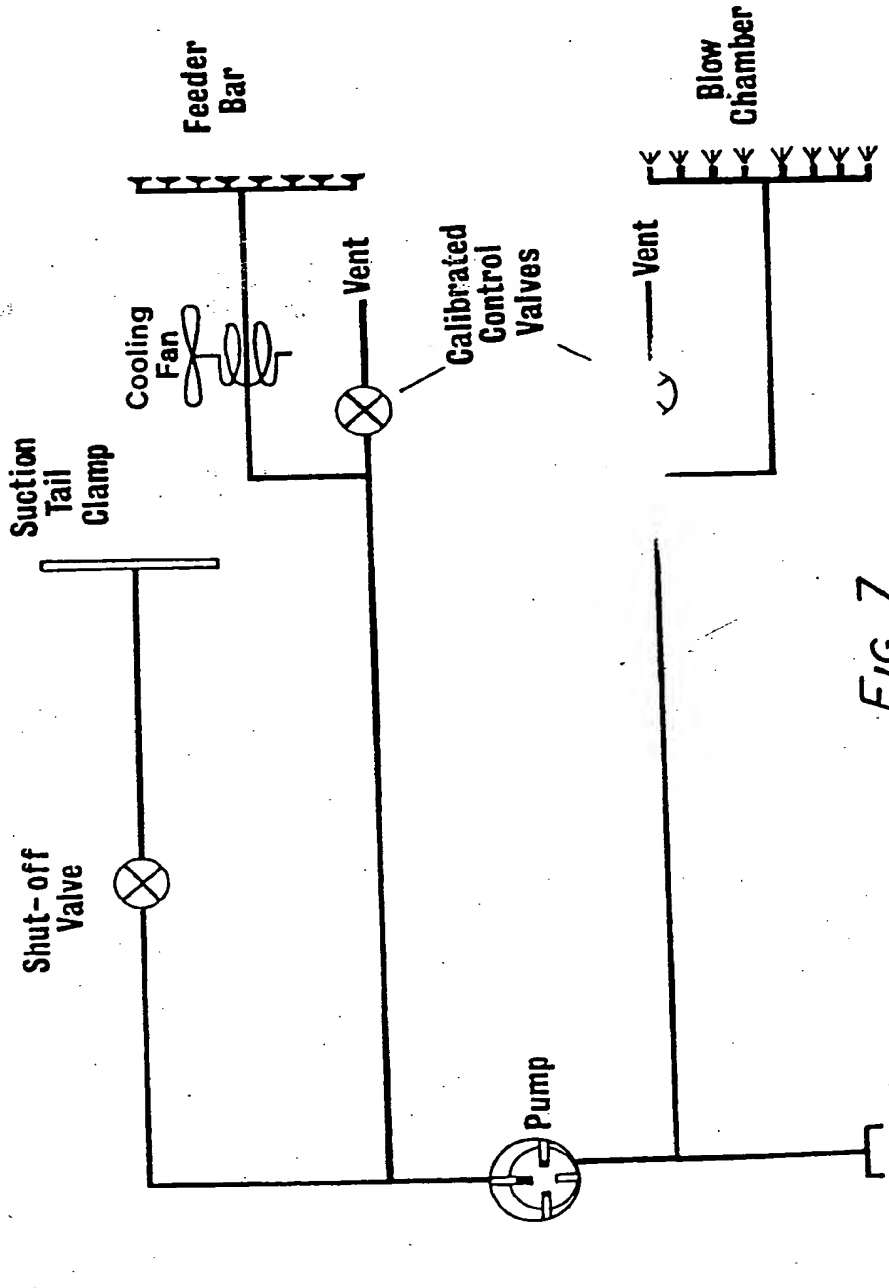
Feeder Bar
Blow Chamber
Cooling Fan
Vent
Calibrated Control Valves
Vent
Suction Tail Clamp
Shut-off Valve
Pump
Fishtail Nozzles

FIG. 7.

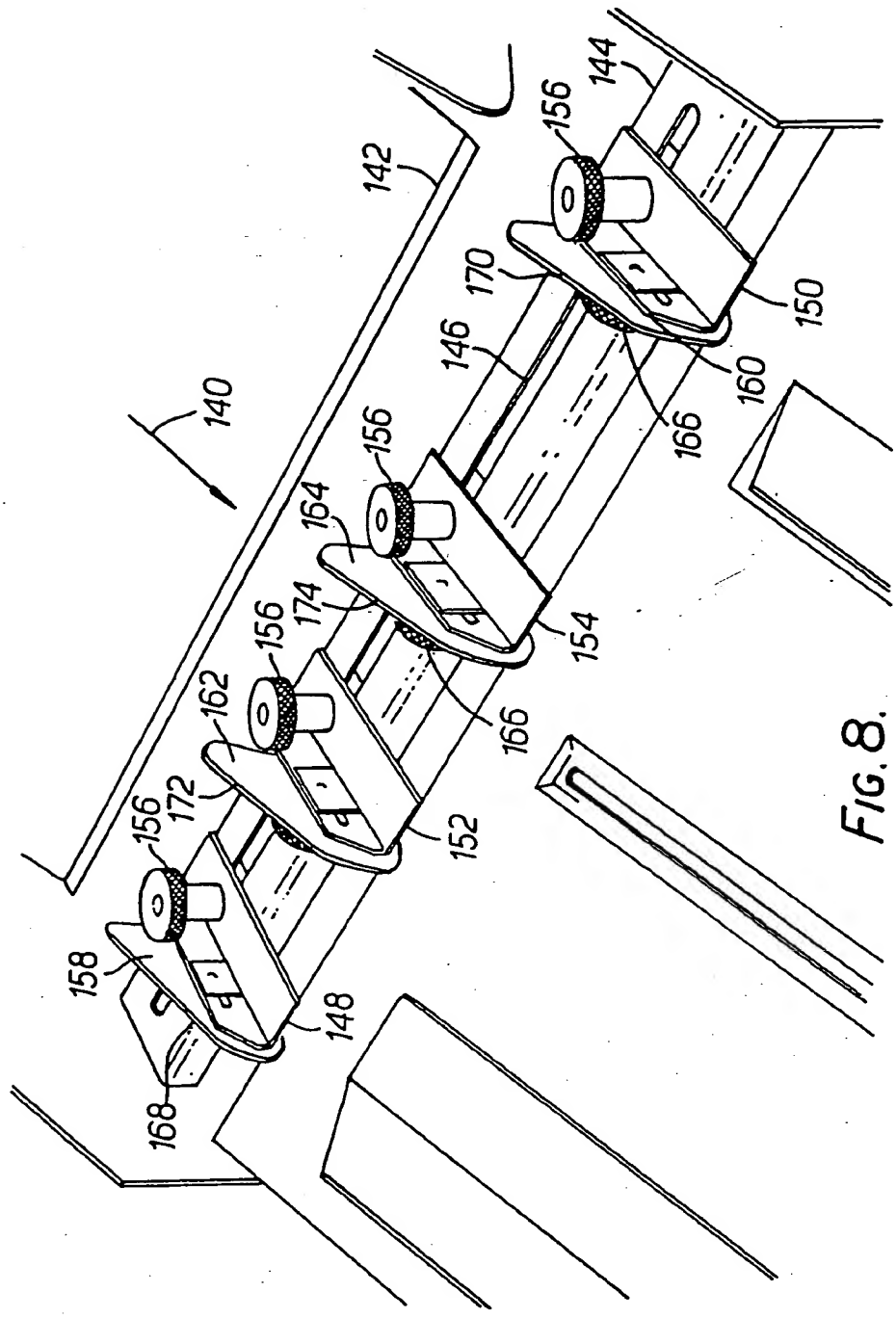
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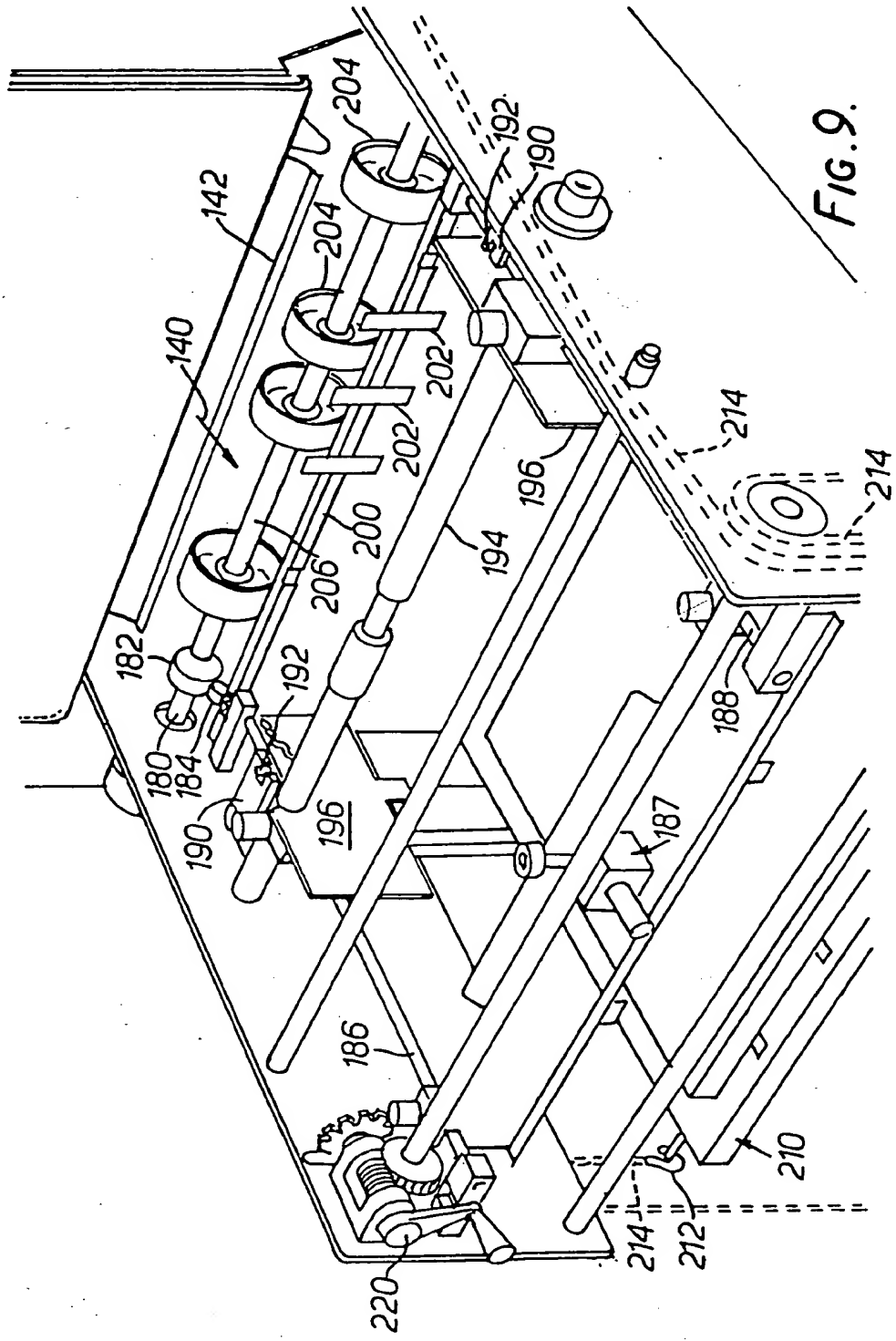
FIG. 8.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186
210
214
212
220

FIG. 9.

SPECIFICATION

Printing machine

This invention relates to a printing machine, and more especially to a sheet-fed printing machine.

The demand by customers of the printing industry for numerically large orders of good quality material at short notice continues to increase, and there remains a need for a printing machine that will enable the industry to meet that demand reliably and economically. The present invention provides a printing machine with several novel features, many of which on their own enable a significant improvement in speed of operation to be made without loss of quality or reliability. The combinations of novel features provided by the machine, moreover, provide an improvement of magnitude substantially greater than would be expected from consideration of the individual features.

The present invention accordingly provides a printing machine having one or more of the following features:

1. Means for assisting the separation of a top sheet from a vertical feed stack of sheets which comprises means for directing toward the underside of the forward end of the top sheet a stream of air from at least one side, and preferably from both sides, of said sheet, the or each means comprising a nozzle with an elongate orifice, preferably a fish tail nozzle, the end nearer the leading edge of the sheet being higher than the end more remote from the leading edge of the sheet, the or each stream being directed upward and toward the middle of the leading edge of the sheet, and advantageously the end of the nozzle nearer the leading edge of the sheet being more remote from the side of the sheet than the opposite end of the nozzle, the extent of the difference in height and distance from the sheet between the opposed ends of the nozzle advantageously being variable;

2. means for feeding the top sheet from the stack, which means comprises means to cause at least the leading edge of the top sheet to be moved backwards in an initial stage of being fed from the stack, the stack advantageously being supported by a backstop (or stops) at least a part of which is capable of being moved backwards, and which is resiliently biassed to urge the uppermost sheets forward;

3. a plate cylinder having means for clamping the tail of a plate thereto by a pressure difference, the cylinder being generally closed and its interior being in communication with means for providing reduced pressure, the circumferential surface having one or more passageways providing communication between the exterior and interior of the cylinder the passagesway(s) being covered by the tail of the plate when present, the passageway(s) advantageously comprising, in the exterior surface of the cylinder, a slot with orifices extending therefrom to the interior surface of the cylinder, the slot being parallel to the axis of the cylinder;

4. a compressor for supplying air at sub-atmospheric pressure to the sheet feeding means, and super-atmospheric pressure to a blow chamber, the connexion between the compressor and the blow chamber advantageously being provided with cooling means, which compressor has at least one inlet line and at least one outlet line capable of being open at all times during operation.

5. means, positioned upstream of a collecting device for printed sheets, to cause the sides of the sheet to be higher than the centre, The means advantageously comprising a central pair of guide surfaces having a lower position than an outer pair of guide surfaces, or, as an alternative to (5)

6. positioned to receive printed sheets delivered from the machine, a sheet stacking means for supporting a vertical stack of sheets, vertically movable to accommodate a growing stack without interfering with delivery, comprising a pair of side patting means, one at each side of the location of the stack, reciprocable from side to side, and patting means reciprocable to and from in the direction of travel of the sheets, positioned to pat the leading edge of the sheets.

Referring again to feature (1), in operation, the elongate nozzles each deliver a stream of air inward, upward and forward against the sides of the uppermost sheets in the feed stack near their leading edges, causing separation of these sheets at corner regions from each other. The air stream itself is of elongate cross-section when it leaves the nozzles, which has proved most advantageous in reducing the incidence of feeding two sheets at once.

In a presently preferred embodiment, each nozzle has an orifice of length about 10 mm and a width of about 2 mm, which is rotatable so that it may be oriented at any angle within the range of from 0° to 90° advantageously of 45°, to the horizontal. In this presently preferred embodiment, the orifice may be rotated to be oriented at any angle within the the range of 0° to 90°, preferably to 45° to the direction of travel of the sheets. Each nozzle is usually mounted to be movable to take into account different sheet widths. Although the nozzles may also be mounted to take into account variation the stack heights (i.e., the adjustment, made for different weights of paper, to the relative height of the rest position of the top sheet and the machine intake means) this is not in general necessary since it has been found in practice that, in operation, the air from the blow chamber of the machine raises the leading edge of light-

weight paper by an amount greater than that of heavy paper or card.

It has been found that good results are obtained when the centre of the orifice is about 8 mm from the sides of the sheets in the stack, and the nozzle is directed to the corner of the top sheet, in its rest position. The air stream, which is advantageously provided by the above-mentioned compressor, may be regulated by a valve, and may be varied to take into account different paper weights.

Referring now to feature (2), the means for feeding the top sheet is advantageously a feeder bar provided with the suctions nozzles. The feeder bar is mounted so that, in operation, in the initial part of the feed cycle, it contacts the top surface of the top sheet, and moves it back a short distance, advantageously a distance in the range of about 2 to 3 mm. Advantageously, the feed bar is mounted so that while moving the top sheet back, it pushes it down advantageously by a distance of about 2 to 3 mm.

The printing machine of the present invention is advantageously provided with means to restrain the leading edge of the sheets in the stack from being blown over the upper edge of the feed mechanism, the top plate. This restraining means is advantageously a row of front hooks which, advantageously, terminate in substantially flat horizontal D-shaped plates, which each protrude a few millimetres over the leading edge of the surface of the top sheet. The hooks are desirably adjustable in the extent of protrusion, for different paper weights, since lightweight paper requires a greater degree of protrusion of the front hooks and lower stack height than does heavier paper or card. The hooks are advantageously mounted on a single assembly, advantageously a pivotally mounted plate, mechanically connected to the stack height adjustment mechanism. By this means, an operator needs only to make a single adjustment for paper weight, and the stack height and extent of protrusion will vary, by means to be described later.

By arranging the feeder so that it moves the top sheet backward and advantageously downward in the initial part of the feed cycle, the sheet being fed clears the restraining means (the front hooks) rather than brushing past them, which could cause damage at high operating speeds.

The feed stack is advantageously provided with side stops and a backstop, which locate the sides and rear of the sheets. As indicated above, at least a part of the backstop is advantageously movable resiliently backward from its normal position. The backstop is urged back by the trailing edge of the top sheet of heavier paper or card when the feeder bar moves the sheet back at the initial stage of the feed cycle. This has the advantage that any slight backward movement of the sheet immediately below the sheet being fed, caused by the movement of the top sheet, is compensated when the backstop resiliently returns to its forward position later in the feed cycle, pushing the next sheet against the front plate and preparing it for accurate head registration.

With lighter paper, the trailing edge of the top sheet does not move the backstop significantly or at all, and a buckle develops in the sheet between the feed bar and the backstop which assists in separating the top sheet.

Referring now to feature (3), problems have been encountered with paper printing plates. These are caused by the paper's absorbing liquid and swelling as well as expanding under the pressure applied thereto during the printing operation. This can cause buckling or creasing of the plate with consequent damage to its printing surface and marking of the printed copy. By providing a cylinder which in operation is maintained at a reduced pressure internally with a passageway through the circumferential surface at the position occupied by the tail of the plate, a paper plate may be secured firmly to the surface of the cylinder. As indicated above, the passageway is in the form of a slot in the exterior surface at a position occupied by the tail of paper plate. The head of the plate is clamped to the cylinder by conventional means.

When the machine is first switched on, the compressor reduces the pressure at the surface of the plate cylinder. The act of loading a plate seals the slot in the cylinder enabling the compressor to evacuate the cylinder and pull the tail of the plate firmly onto the surface of the plate cylinder. When the plate is ejected the seal is broken and the cylinder is thus vented to atmosphere. In the case of metal plates a similar action takes place but the tail of a metal plate is normally held in a conventional pin-bar clamp. The metal plate blanks off the slot in the plate cylinder as a secondary effect. Once a plate has been loaded, be it a paper plate or metal plate and the compressor is running, a steady state may rapidly be achieved, enabling the blow control and suction control valves to be set with repeatability.

Advantageously, there is also provided a shut-off valve to disconnect the source of low pressure from the cylinder, for use when a metal plate is installed. This simplifies control if, for example, a metal plate that is slightly buckled does not provide complete blanking off to the slot.

Referring now to feature (4), in the preferred embodiment the output from the compressor is fed directly to the blow chamber. In the connexion between the compressor and the blow chamber there is provided a T-piece permitting the line to vent to the atmosphere through a valve which may be closed when

the feed sheet stack contains card and fully open for lightweight paper. When the valve opens, the compressor output is primarily through the valve instead of through the blow chamber.

Similarly, a T-piece is connected between the inlet of the compressor and the suction nozzles on the feeder bar. Advantageously, a suction control valve is fitted between the T-piece and the compressor to restrict the maximum suction applied to the feeder bar. The arm of the T-piece venting to the atmosphere is preferably also provided with a valve which is fully open when feeding lightweight paper.

Advantateously, the compressor is a positive displacement compressor operating at a constant speed and ideally the load on each side of the compressor should be constant. In practice, however, the action of lifting the top sheet from the stack causes the suction nozzles on the feeder bar to be closed off momentarily reducing the air supply to the inlet of the compressor. The act of interruption the feed to the compressor modulates air flow to the blow chamber which assists in agitating the stack which in turn assists in good sheet separation. A suction timing valve is provided between the T-piece on the inlet line and the feeder bar, which vents to atmosphere to allow the feeder bar to drop the sheet as in a conventional machine.

As indicated above, the connexion between the compressor and the blow chamber is advatageously provided with cooling means. This may comprise a coil cooled by, e.g., a fan and this has the advantage that the machine may be left operating in an idling mode with reduced risk of shrinkage of the leading edges of the sheets in the stack caused by warm air being blown onto them.

Referring now to feature (5), the guide surfaces slope downward in the direction of travel of the sheet. The central pair of guide surfaces may be parallel to and in a lower plane than the outer pair, or the outer guide surfaces may be at a steeper slope than the inner surfaces, the upstream ends of the surfaces being higher for the outer surfaces than for the inner. In the preferred embodiment, the surfaces are the upper surfaces of generally triangular vertical plates, which are pivotally mounted toward their lower, downstream, ends to permit variation of the slopes and differences between the slopes.

By means of the guide surfaces as described, the printed sheet is provided with an artificial or temporary stiffness, by imparting curvature to the sheet. The preferred guide surfaces also reduce drag, compared with that of a continuous, but otherwise similar, surface guide, and avoid the leading edge of one sheet contacting the trailing of a preceding sheet. The temporary stiffness imparted to a sheet, especially of lightweight paper, by curving the sheet so its edges are higher than its central region, enables the flight of the sheet from the printing machine to the collecting device to be closely controlled, and facilitates collection and stacking.

As indicated above, as an alternative to the guide surfaces, the machine may be provided with feature (6), a sheet stacking means for collecting printed copies which is advantageously positioned below the sheet delivery means of the machine, and is advantageously provided with a support member movable downward as the stack of collected sheets grows, the movement advantageously being controlled, directly or indirectly, by the feed of sheets into the machine or in conformity with the rise of a support member of the feed stack.

Upstream of the stacking means there is provided means for accelerating the sheets delivered by the machine, advantageously comprising a roller assembly the circumferential surface or surfaces of which are rotated at a speed faster than that at which the sheets are delivered by the machine. The rollers are provided with friction surfaces, (e.g., rubber) so that they impart to each sheet a sufficient to clear its trailing edge from the machine before the arrival of the following sheets leading edge. Advantageously, the roller speed is up to 20% greater than the linear delivery speed. In the preferred embodiment, the accelerating means also directs the sheet substantially horizontally away from it.

In a preferred embodiment, the machine is provided with means for detecting when more than one sheet (hereinafter termed a "double") has been picked up from the stack – hereinafter termed a "double detector". Advantageously, there is positioned, immediately downstream of the delivery means from the machine, and accordingly upstream of feature (5) or feature (6), means for directing the resulting "double" from the delivery stack – hereinafter termed a "doubles deflector". The doubles deflector preferably comprises a delivery chute pivotally mounted at its upstream and means for rotating it about the mounting so its downstream end is positioned to direct each sheet either at the delivery stack or, when the doubles detector indicates a double, to a separate collecting station. In a preferred embodiment means are provided to actuate the doubles deflector to deliver a sheet to the separate collecting station, to allow the print quality to be checked at intervals. When the machine is provided with a counter to indicate the number of sheets printed, actuation of the doubles deflector advantageously interrupts the count, so that the counter indicates the number of sheets delivered to the delivery stack.

It will be appreciated that the other parts of the printing machine may take any form, many of which are conventional, compatible with any of the specified features, or with any

combination of the specified features, and it is to be understood that the features specified may be employed singly or in any desired combination.

A printing machine constructed in accordance with the invention will now be described in greater detail by way of example only, with reference to the accompanying drawings, from which many details of the machine not relevant to the invention have been omitted, and in which

Figure 1 is a plan view of the feed stack and machine intake,

Figure 2 is a detailed perspective view of a nozzle and front hook,

Figure 3 is a perspective view of the machine intake,

Figure 3A is a schematic elevation showing the stack height adjustment mechanism and the linkage to the front hooks,

Figure 4 is a perspective view of the feeder stack side guides and backstops,

Figure 5 is a perspective view of the feeder bar and operating mechanism.

Figure 6 is a cross-section through the vacuum plate cylinder,

Figure 7 is a block diagram of the compressor circuit,

Figure 8 is a perspective view of the guide surfaces of feature (5), and

Figure 9 is a perspective view of the alternative delivery stacking device.

Referring now more especially to Figs. 1 to 3, a printing machine is provided at its feed end with a top plate 10 and a front plate 12. Side plates 14, 16, mounted on a support (not shown) allowing lateral movement to take account of different sheet sizes, carry hollow square support frames 18, 20, in which in turn are slidably mounted tubes 22, 24, of square external cross-section. The lower ends of the tubes 22, 24 are connected by flexible hoses 26, 28 to the outlet of a compressor (not shown), the upper ends terminating in a ridge, one face of which carries an outlet pipe 30 (see Fig. 2) on which is rotatably mounted a fishtail nozzle 32 having an elongate orifice 34. The preferred orientation of the nozzle 32 and height of the tubes 22, 24 are such that the orifice 34 is at an angle of 45° to the horizontal, and to the direction of travel of the sheets being fed, the upper end of the orifice of each nozzle 32 being nearer to the front plate 12, and further from the sheets being fed, than is the lower end, and the nozzles are directed to the corners at the leading edge of the top sheet of the stack.

Mounted downstream of the front plate 12 on a vertical support member 40 are front hooks 42 of resilient material, each hook 42 terminating in a D-shaped horizontal portion 44 which projects through an aperture in the front plate 12. Also downstream of the front plate 12 is positioned a blow chamber 46, having apertures 48. The blow chamber 46 is connected to the outlet of the compressor and, in operation, air issues from the apertures 48 against the leading edges of sheets at the top of the feedstack, assisting in their separation. This air tends to blow the top sheet upward and over the edge of the top plate 10, and the D-shaped portions 44 restrain the sheet.

Referring more especially to Fig. 3A, there is shown a part only of the stack height adjustment mechanism. A plate 50 is pivotally mounted on a shaft 52 and is moved by a handle 54, the free end of which is positioned near a gauge (not shown) which may be calibrated in terms of paper weights. An extension plate 56, carrying a pin 58, is mounted on the plate 50, the pin being captured in the forked end 50 of a rod 62 pivotally mounted on a shaft 64. The end of the rod 62 beyond the pivot is connected to the vertical support member 40. As a result, movement of the handle 54 to adjust the stack height causes variation in the extent of protrusion of the D-shaped portions 44 of the front hooks through the front plate 12.

Referring now more especially to Figs. 4 and 5, there are shown the mechanisms for imparting to a feeder bar 70 a backward movement at the point in its cycle where it picks up a sheet, and the means whereby a backstop assembly indicated generally by the reference numeral 72, may allow the resultant backward movement of a sheet to be accommodated.

The feeder bar 70 carries a plurality of suction nozzles 74 and is supported at each end on linkage bars 76. Rotatably mounted at each side of the machine, and driven by the main drive (not shown) of the machine by means not shown, are double-sided drive cams 78. Pivotally mounted on shafts 80 fixed to the machine are arms 82, 82, one free end of each which carries a cam follower 84 which follows the outside cam track 86, and arms 88, 88, which each carry, intermediate their ends, a cam follower 90 which follows the inside cam track 92. The end of each arm 88 below the shaft 80 carries a counterweight 94 to balance the forces exerted on the assembly by the feeder bar 70 during high speed operation. The end of each arm 82 remote from the cam is pivotally linked to the end of the linkage bar 76. A projection 96 from the linkage bar 76 carries, pivotally mounted thereon, a link 98 which is also pivotally linked to the end of the arm 88 above the shaft 80.

The cam tracks 86 and 92 and the linkages are so shaped that, in operation, the orientation of the feeder bar remains substantially constant, and the suction nozzles 74 remain facing substantially downward, the path of the cam follower 84 in the track 86, and its associated linkages, essentially determining the horizontal component of the movement of

the feeder bar 70, the path of the cam follower 90 in the track 92 essentially determining its vertical component. Together, the movement is such as to cause the nozzles 74 to move downward onto the top sheet and upward (lifting the top sheet) and backward, forward movement to take the leading edge over the edge of front plate 12 onto the top plate 10 being delayed enough to allow the leading edge to clear the front hooks 42. At the same time, the supply of reduced pressure is timed to provide suction at the nozzles 74 until the feeder bar 70 has carried the sheet to the top plate, when it is interrupted to allow the sheet to drop.

Referring again to Fig. 4, the assembly 72 comprises a horizontal bar 100 having a slot 102 along most of its length. Extending through the slot 102 are a pair of bolts 104, 104 which carry internally threaded members 106, 106, which in turn each carry slotted side guides 108 and back stops 110, 110. As can be seen most clearly from the inset to Fig. 4, the back stops 110 are each mounted on the members 106 by two bolts 112, 114 each carrying a spring 116 resiliently urging the stops 110 forward (i.e., in the feed direction of the paper).

The bolts 104 can be loosened to slide them along the slot 102 to take different paper widths into account so the side guides 108 are properly positioned. Further, the slots in the stops 110 are dimensioned to allow free vertical movement of the stops 110 relative to the members 106, so that when the supply of paper in the paper stack 118 is small, and the stack support plate 120 high, the upper surface of the latter will push the backstops 110 upward as the stack is fed to the machine. A similar arrangement (but without the resilient feature) allows the side guides 108 to be moved up also.

In operation, with relatively heavy paper or card, when the feeder bar 70 moves the leading edges of the top sheets of the stack 118 backward, the trailing edges also move backward, and push back the backstops 110 against the force of the springs 116 to the position shown in the inset in Fig. 4. After the top sheet is carried away by the suction pads 74, the resilient back stops urge the top sheets forward against the front plate 12, thereby assisting in good head registration.

Referring now more expecially to Fig. 6, a plate cylinder, indicated generally by the reference numeral 130 has a clamping mechanism 132 for the head of a plate. At one end of the cylinder there is provided a running joint (not shown) to the support shaft (also not shown) by means of which the interior space 134 of the cylinder may be connected to the inlet of the compressor. A groove 136 is milled or otherwise provided in the circumferential surface of the cylinder 130, and a plurality of tubes 138 connect the space 134 with the groove 136. In use, the head of a plate, especially a paper plate, is fed into the machine and is clamped by the mechanism 132, the head facing counterclockwise in the view shown in the drawing. The pressure within the space 134 is reduced below atmospheric by the compressor, resulting in the tail of the plate's being pressed against the surface of the cylinder in the region surrounding the groove 136. Advantageously, the line between the compressor and the running joint is provided with a shut-off valve to deal with any problems associated with a metal plate, as discussed above.

Referring briefly now to Fig. 7, a preferred circuit diagram for the compressor is illustrated.

Referring to Fig. 8, there is shown the delivery end of the printing machine, the arrow 140 indicating the direction of travel of the printed sheet over a doubles deflector 142. A bar 144 having a slot 146 along most of its length carries four support plates, an outer pair 148 and 150, and an inner pair 152 and 154. Each plate is slidably mounted on the bar by bolts 156 with knurled heads 156 allowing lateral adjustment in the slot 146. Generally triangular plate 158 and 160 are each mounted by way of bolts 166 on the outer plates 148 and 150, while similar triangular plates 162 and 164 are mounted in the same manner on the inner plates 152 and 154, bolts 166 with knurled heads allowing adjustment of the angle of slope of the top surfaces 168, 170 and 174 of the plates, which top surfaces provide the guide surfaces. In operation, the plates are laterally adjusted along the groove 146 to take account of the paper width, and the bolts 166 adjusted so that the outer guide surfaces 168 and 170 have their ends closer to the doubles deflector 142 higher than the corresponding ends of the inner guide surfaces 172 and 174.

Referring now to Fig. 9, there is shown, as an alternative to the device shown in Fig. 8, a delivery stacking device capable of collecting a number of sheets that may equal the number in the feed stack, while providing a stack of well-aligned sheets. A shaft 180 is driven by the main drive of the machine to make one revolution for each sheet printed, and delivered by the machine. An eccentric 182, carried by the shaft 180, causes a roller 184, and hence a shaft 186 on which the roller 184 is mounted, to execute fore-and-aft oscillatory motion. This causes a front patter bar assembly 186 to move fore-and-aft, which in turn transmits the motion to a shaft 188, parallel to the shaft 180, on the other side of the machine. The shafts 180 and 188 each carry a bell-crank 190 captured on a pin 192, by which the fore-and-aft motion is converted to opposed lateral motions in the expanding shaft 194, which carries at its opposed ends side patter plates 196 which accordingly are

provided with a lateral oscillatory motion.

A transverse bar 200 carries backstops 202.

The shaft 180 carries a roller assembly 204. The roller assembly 204, though carried on the shaft 180, is mounted on an outer shaft 206 which is driven by the shaft 180 through an overdrive gear (not shown), so that the assembly 204 is rotated at a rate up to 20% or more in excess of the rate of rotation of the shaft 180.

A delivery support 210 is carried at each corner by hooks 212, attached to chains 214. The chains are linked, directly or indirectly, to the operation of the feed stack support 120, and drop the delivery stack support 210 a distance corresponding to the distance which the feed stack is raised. A mechanism 220, which in the embodiment illustrated is a hand-operated positive-drive worm device, is provided to return the stack support 210 to a desired location.

In operation, the sheets being delivered over the doubles deflector 142 are taken up by the roller assembly 204 and accelerated, and at the same time directed to a substantially horizontal trajectory above the backstops 202 and against the top region of the front patter assembly 186. They then fall toward the support 210, or the sheets already thereon, and are patted, by the front and side patters 186 and 196, into a tidy stack.

In the embodiments illustrated in Figs. 8 and 9, there may be provided, above the collection mechanisms shown, a tray (not shown), into which, when the doubles deflector is raised in response to a signal from the doubles detector (not shown) or a copy-quality check device (also not shown), a double or proof sheet may be directed.

CLAIMS

1. A printing machine characterized by having means for assisting the separation of a top sheet from a vertical feed stack of sheets which comprises means for directing toward the underside of the forward end of the top sheet a stream or air from at least one side of said sheet, the or each means comprising a nozzle with an elongate orifice, the end nearer the leading edge of the sheet being higher than the end more remote from the leading edge of the sheet, the or each stream being directed upward and toward the middle of the leading edge of the sheet.

2. A machine as claimed in claim 1, which has a said nozzle on each side.

3. A machine as claimed in claim 1 or claim 2, wherein the or each nozzle is a fishtail nozzle.

4. A machine as claimed in any one of claims 1 to 3, wherein the end of the nozzle nearer the leading edge of the sheet is more remote from the side of the sheet than is the opposite end of the nozzle.

5. A machine as claimed in any one of claims 1 to 4, wherein the extent of the difference in height and/or distance from the sheet between the opposed ends of the nozzle is variable.

6. A machine as claimed in claim 1, substantially as described herein with reference to, and as illustrated by any one or more of Figs. 1 to 3.

7. A printing machine, characterized by having a vertical feedstack, and means for feeding the top sheet from the stack, which means comprises means to cause at least the leading edge of the top sheet to be moved backwards in an initial stage of being fed from the stack.

8. A machine as claimed in claim 7, wherein the stack is provided with at least one backstop at least a part of which is capable of being moved backwards, and which is resiliently biassed to urge the uppermost sheets of the stack forward.

9. A machine as claimed in claim 7, wherein the feed means is substantially as described with reference to and as illustrated by Fig. 5 of the accompanying drawings.

10. A machine as claimed in claim 8, wherein the backstop is substantially as described with reference to and as illustrated by Fig. 4 of the accompanying drawings.

11. A printing machine characterized in having a plate cylinder having means for clamping the tail of a plate thereto by a pressure difference, the cylinder being generally closed and its interior being in communication with means for providing reduced pressure, the circumferential surface having one or more passageways providing communication between the exterior and interior of the cylinder, the passageway(s) being covered by the tail of the plate when present.

12. A machine as claimed in claim 11, wherein the passage(s) comprise, in the exterior surface of the cylinder, a slot with orifices extending therefrom to the interior surface of the cylinder, the slot being parallel to the axis of the cylinder.

13. A machine as claimed in claim 11, substantially as described with reference to and as illustrated by Fig. 6 of the accompanying drawings.

14. A printing machine, characterised by having a compressor for supplying air at sub-atmospheric pressure to a sheet feeding means, and super-atmospheric pressure to a blow chamber, which compressor has at least one inlet line and at least one outlet line capable of being open at all times during operation.

15. A machine as claimed in claim 14, which also comprises cooling means for the connexion between the compressor and the blow chamber.

16. A machine as claimed in claim 14, having connexions to the compressor substan-

tially as illustrated by Fig. 7 of the accompanying drawings.

17. A printing machine having means, positioned upstream of a collecting device for printed sheets, to cause the side of the sheet to be higher than the centre.

18. A machine as claimed in claim 17, wherein means comprises a central pair of guide surfaces having at least portions thereof lower than corresponding portions of an outer pair of guide surfaces.

19. A machine as claimed in claim 18, wherein the upstream portions of the central pair of guide surfaces are lower than the upstream portions of the outer pair, and each guide surface sloping downward in the direction of travel of the sheet, the slope of the outer pair being steeper than that of the inner pair.

20. A machine as claimed in claim 17, substantially as described with reference to and as illustrated by Fig. 8 of the accompanying drawings.

21. A printing machine having, positioned to receive printed sheets delivered from the machine, a sheet stacking means for supporting a vertical stack of sheets, vertically movable to accommodate a growing stack without interfering with delivery, comprising a pair of side patting means, one at each side of the location of the stack, reciprocable from side to side, and patting means reciprocable to and fro in the direction of travel of the sheets, positioned to pat the leading edge of the sheets.

22. A machine as claimed in claim 21, also comprising means to accelerate the printed sheets delivered from the machine before they are received by said stacking means.

23. A machine as claimed in claim 21, substantially as described with reference to and as illustrated by Fig. 9 of the accompanying drawings.

24. A printing machine substantially as described with reference to and as illustrated by any one or more of the accompanying drawings.

25. A printing machine having the features specified in claims 1, 7, 11 and 17.

26. A printing machine having the features specified in claims 1, 7, 11 and 21.

27. Any new and novel feature or combination of features hereinbefore described.

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